A comparative analysis of road financing approaches in Europe and the United States

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1 INTRODUCTION

HIGHLIGHTS – ROAD FUNDING IN THE UNITED STATES:

- The viability of the present system of road funding has in recent years been widely questioned, for it has proved insufficient to support spending programs at their current levels.
- Some transfers from the general fund have been needed since 2008 to keep the HTF solvent.
- Fuel taxes, the primary source for funding roads in the US, have not kept pace with inflation for years.
- A wide variety of measures to increase revenue has been presented: raising fuel taxes, extending toll highways, implementing a VMT fee, etc.

EUROPEAN COUNTRIES:

- Facing serious budgetary constraints as a result of the economic recession, what is limiting their resources to fund roads.
- Some countries have implemented road pricing approaches –that would include charges on HGVs in interurban roads– with the aim of providing stable revenue sources for funding roads and promoting a more sustainable transport system.

PREVIOUS STUDIES:

- A direct comparison of American and European approaches for funding roads has never been conducted in the literature.

OBJECTIVES:

- Fill the research gap found in the literature on transport financing, and derive conclusions about the funding system in selected countries.
- Update previous analysis of road funding and transportation policy both in Europe and the US.

2 METHODOLOGY

1. This study calculates the balance between road-generated revenue and road expenditure in the US and several European countries. Main facts:
   – Countries selected: US, Germany, France, UK, Spain, Switzerland. Different characteristics in terms of area, population, GDP, location in the continent, etc.
   – Period of analysis: 2004 – 2009.
   – Covering the whole interurban network as identified in the records of each country
2. The methodology for this research has required 2 Steps:
   – Revenue vs. Expenditure balance of the road sector.
   – Comparison of the annual amount of road charges paid per driver.

2.1 REVENUE vs. EXPENDITURE BALANCE

The analysis we conduct in this research establishes a balance between charging for the use of, and expenditure on, the road sector. By collecting a great amount of data from official government sources (Ministries, Departments, Institutes, etc.), three items have been calculated:

– Road Expenditure (RE): includes annual expenditure for both roads supported at different government levels (federal, regional/state, local) and for private roads (see table below).
– Road-Generated Revenue (RGR): includes all kinds of fee-charges applied to road users, and taxes applicable in a special way to road vehicles (see table below).
– Allocated Revenue (AR): annual RGR that is directly dedicated to funding highways, not necessarily specific road projects. RGR allocated to other policies is not accounted within the road sector balance.

Concept	Road Expenditure (RE)	Road-Generated Revenue (RGR)
Items included	Public capital outlays	Fuel tax
		Public tolls
		Private tolls
	Private capital outlays	Vignettes
		Heavy Vehicle Fee (Eurovignette)
	Public maintenance disbursements	Vehicle Excise Duties: vehicle ownership fee, registration fee, purchase fee, etc.
	Private maintenance disbursements	Other Vehicle fees
		Company car taxation

RE does not include items such as enforcement, interest on debt, management expenditure, etc., as data was not available in a similar and comparable form for all the countries in the sample.

Taxes that are applied in a fairly homogeneous way across different economic sectors (value added tax, sales tax, etc.) are not included within RGR.

2.2 ANNUAL AMOUNT OF CHARGES PAID PER DRIVER

1. We make a comparison of charges applied to different kind of vehicles across the selected countries for the sample. Three types of vehicles –whose characteristics are shown in the table below– have been considered.
2. We apply rates according to what was imposed as of January 1, 2012.

Concept	Light vehicle		Heavy vehicle
	Gasoline	Diesel	
Annual mileage (km)	20,000	20,000	95,000
Fuel consumption (liter/100 km)	6.7	5.3	28.0
Power (Horsepower)	115	116	350
Vehicle weight (ton)	1.2	1.2	10.0
Maximum weight (ton)	na	na	26.0
Life (years)	10	10	10

We include only the user charges eligible for road-generated revenue, as set out in Section 2.1

Due to the great variability of road fees in the US at state and local level, several state DOTs were asked to supply figures for road taxation.

The type-of-vehicle approach is not intended to reflect a hypothetical "average" vehicle either in the US or in Europe. Rather, it is meant to show the charging differences across different countries in a way that allows for easy and homogeneous comparison, controlling for variables (annual mileage, fuel consumption, etc.) which might vary in each nation.

3 RESULTS AND COMMENTS

This section summarizes the main findings from the analysis developed in sections 2.1 and 2.2. Some data limitations have been found when collecting information from official sources. Therefore, the study finding should be taken good approximations of the true values rather than the exact ones.

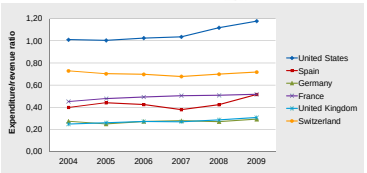
3.1 REVENUE vs. EXPENDITURE BALANCE

With the data collected from national sources, we have calculated three ratios:

– Expenditure/Revenue Ratio: shows the money spent on roads per dollar levied.
– Expenditure/GDP Ratio: shows the effort made in terms of road expenditure as compared to GDP.
– Road Allocation Ratio: shows the share of road-generated revenue allocated to road purposes.

Expenditure/Revenue Ratio

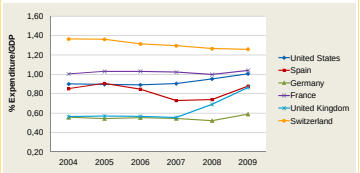
$$\text{Expenditure/revenue ratio} = \frac{RE}{RGR}$$



For European governments, RGR greatly exceeds RE, what means that road transport revenues are being used to fund other government policies. By contrast, the US road system has needed additional funds from general taxation to fund roads, especially after FY2007.

Road Expenditure/GDP Ratio

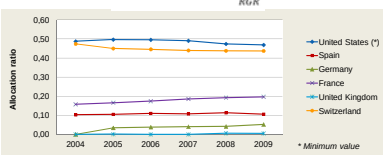
$$\text{Expenditure/GDP ratio} = \frac{RE}{National\ GDP}$$



Most of the countries in the sample exhibit an expenditure on road transport between 0.5 and 1.0% of their GDPs. The most suitable ratio in each country is not necessarily comparable since it might vary according to population, area, density, etc.

Road Allocation Ratio

$$\text{Road Allocation Ratio} = \frac{AR}{RGR}$$



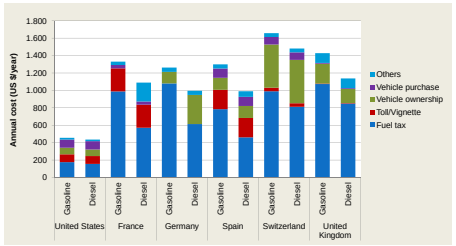
The US has the highest allocation ratio, about 0.50. However, this ratio has to be considered as a minimum value because we did not include any allocation of revenue to roads, apart from state fuel taxes, at the state or local level . France and Spain have ratios between 0.2 and 0.1 because its only dedicated revenues are private tolls. Germany and UK have even lower values.

We can observe that, despite the little size in the sample, the higher the Road Allocation Ratio the higher seems to be the level of road expenditure.

3.2 ANNUAL AMOUNT OF CHARGES PAID PER DRIVER

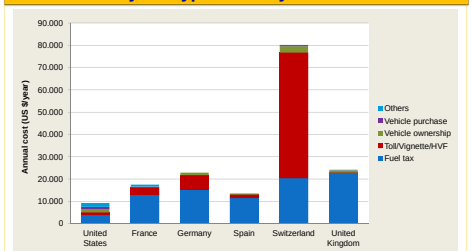
In order to make the previous analysis more understandable, the following figures show the annual charges levied on light and heavy type-vehicles, as defined in the methodology. Despite differences among nations, we observed that road charges in the US are noticeably lower than those in European countries.

Annual specific road charges paid by the type of light vehicles



Differences in the sample range from 2.7 to 3.6 for gasoline vehicles, and from 2.2 to 3.4 for diesel vehicles. The greatest divergences are caused by the low level of fuel tax rates applied in the US (77-83% lower for gasoline vehicles, and 66-81% lower for diesel vehicles).

Annual specific road charges paid by the type of heavy vehicle



As for heavy vehicles, average annual US charges ranged from being 32% lower than those in Spain to 62% lower than those in UK. Again, the main difference between US and European countries has to do with the rates of fuel taxes.

4 CONCLUSIONS

1. The implementation of new tolls to heavy vehicles in Europe has not been accompanied by a reduction of other road charges, such as fuel, vehicle-ownership, etc. By contrast, the US has conducted little reforms in its roads funding model, leading to raise scarce revenue to cover the necessary road expenditure.
2. European roads subsidize other government policies, whereas US roads have to be subsidized by the public sector through general fiscal revenues.
3. Low road charges are applied in the US when compared to European countries (127 – 214% higher for light vehicles, 46 – 162% higher for heavy vehicles), especially with regard to fuel taxes.
4. In spite of the high Road Allocation Ratio of the US, road-generated revenue has not been able to cover road expenditure needs in the last few years. This might suggest that the level of road charges in the US is becoming lower than needed.
5. Further research should explore issues such as: the impact of road-charging in sustainability, the impact of cross-subsidies from the road sector to other transportation modes or other sectors of the economy with lower externalities, and the optimal revenue to be allocated to the road sector.